

APPLICATION SERIAL NO. 10/751,301

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REMARKS

As of the Office action dated November 13, 2006, claims 1-15 and 17-20 are pending, with claims 1, 2, 4, 5, 7, 9-12, 14, 15, 17 and 19 having been rejected, and claims 3, 6, 8, 13, 18, and 20 having been objected to. Claim 16 was previously canceled. In this Amendment After Final, claims 14, 15, 17 and 19 have been canceled to remove them from consideration, and claims 18 and 20 have been rewritten to overcome the objection thereto and place them in condition for allowance. The examiner is respectfully requested to withdraw the rejection of claims 1, 2, 4, 5, 7 and 9-12, because the teachings of the new references applied by the examiner have been misunderstood and are in fact irrelevant. In view of the amendment and remarks, the examiner is requested to pass the application to allowance.

*Status of Request for Examiner
Interview*

In the prior response, applicants made an express request for an examiner interview prior to final Office action in the event that the examiner did not find the claims to be allowable. The examiner failed to act on this interview request. Applicants believe that such an interview would have significantly advanced the prosecution of the present application, particularly since applicants' intended meaning of the term "chargeable" as expressed in the record was not terribly different from the examiner's view of how the claim should be limited.

Applicants have amended claims 1 and 13 as explained below, in a attempt to further the prosecution by clarifying the claim language in response to the examiner's perception of the effect of the prior amendment. If the examiner is still not satisfied with the particular wording of the amendment, applicants respectfully request that the examiner contact the undersigned to resolve any remaining issue, particularly since there appears to be no disagreement in principle.

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Explanation of the Amendment

The examiner stated that the prior amendment to claim 1 regarding the use of the term "chargeable" effectively broadens the claim with respect to an applied voltage magnitude. The examiner interprets the change as requiring only that the capacitors have the physical ability to be charged to the stated magnitude.

The examiner's construction of the phrase in question was not applicants' intention, as was clear from applicants' remark in the prior response on page 10 that "[t]his amendment makes clear that the first and second voltage magnitudes refer to the voltage on the respective capacitors before discharge." Claims 1 and 13 have been amended in a further attempt to capture applicants' intention while complying with the examiner's desire for clarity. Specifically, the claims now provide that the energy storage elements are operatively charged to their respective voltage magnitudes, and the laser diode is controllably coupled to the energy storage elements for operatively receiving a discharge of energy therefrom.

Claim 13 has been further amended by relocating the phrase "through the switch-controlled circuit" to bring maintain consistency in language between claims 1 and 13. The scope has not been altered by this change.

Since there appears to be no fundamental disagreement between applicants and the examiner about how claims 1 and 13 should be limited, applicants would respectfully request the examiner to contact the undersigned to work out acceptable language if the examiner is not entirely satisfied with this amendment.

Claims 18 and 20 have been rewritten in independent form to place them in condition for allowance, as suggested by the examiner.

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*The Teachings of Hannan et al. are Irrelevant
to Claims 1, 2, 4, 5, 7 and 9-12*

Claims 1, 2, 4, 5, 7 and 9-12 have been rejected under 35 USC § 102(b) as being anticipated by a new reference, US Patent No. 3,371,232 issued to Hannan et al. However, Hannan does not support a prima facie case of anticipation of claims 1, 2, 4, 5, 7 and 9-12, because the examiner has misunderstand its teachings. Properly understood, the teachings of the reference are in fact irrelevant. The examiner is respectfully requested to withdraw the rejection.

With reference to Figure 2 of Hannan, the examiner compares the claimed first energy storage element in the slow voltage discharge stage to capacitor 34, and the second energy storage element in the fast voltage discharge stage to capacitor 40. The examiner states that the voltage across capacitor 40 (which is compared to the second voltage magnitude) can be greater than the voltage across capacitor 34 (which is compared to the first voltage magnitude). This is not true.

The examiner's understanding of the teaching of Hannan is wrong. In fact, what happens is the following. Capacitor 34 is charged to the supply voltage 49. When switch 45 closes, current flows from capacitor 34 through diode 62, switch 45, laser diode 30, diode 37, capacitor 40 and then back to capacitor 34. Using Kirchhoff's Voltage Law which states that the sum of the voltages around the loop has to be equal to zero, we have:

$$V_{34} = V_{62} + V_{45} + V_{30} + V_{37} + V_{40}$$

Even if we ignore voltage drops across the diodes and switch during condition, the largest voltage that capacitor 40 can be charged to is the voltage on capacitor 34, or:

$$V_{34} = V_{40}$$

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Hannan even states this condition when explaining the circuit operation in referring to simplified Figure 1. He states in column 2, lines 12-16 that "[w]hen switch 25 is closed and switch 26 is open, current flow through the laser diode 15 and diode 21 charging the capacitor 23 in one direction to a positive voltage equal to the supply voltage 12 or half the voltage across the series connection voltage sources 12, 13 (+E/2)" (emphasis supplied). The supply voltage 12 is analogous to the supply voltage 49 in Figure 2, which charges capacitor 34. Hannan therefore teaches that the voltage across capacitor 23 (in Figure 1) or capacitor 40 (in Figure 2) cannot be greater than the voltage across the voltage source 12 (in Figure 1) or the voltage across the capacitor 34 (in Figure 2). Thus Hannan teaches exactly the opposite of what the examiner states, and exactly the opposite of what is claimed in claim 1.

A further distinction is that the circuit containing capacitor 40 is not a fast voltage discharge stage because it is incapable of function as such. The claimed fast voltage discharge stage determines the rise time of the pulse, not the pulse width (which is determined by the slow voltage discharge stage). However, Hannan teaches that in column 4, lines 17-18, that "[c]apacitor 40 determines the time constant of the pulse energy so applied or pulse duration." Hence, the circuit containing capacitor 40 cannot be considered to be a fast voltage discharge stage.

*The Teachings of Takahashi et al. are
Irrelevant to Claims 1, 2, 4 and 9-12*

Claims 1, 2, 4 and 9-12 have been rejected under 35 USC § 102(b) as being anticipated by a new reference, US Patent No. 4,928,248 issued to Takahashi et al. However, Takahashi does not support a prima facie case of anticipation of claims 1, 2, 4 and 9-12, because the examiner has misunderstand its teachings. Properly understood, the teachings of the reference are in fact irrelevant. The examiner is respectfully requested to withdraw the rejection.

Takahashi does not teach coupling a laser diode through a switch-controlled circuit path to first and second energy storage elements. In fact, Takahashi is based on

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using an opening switch (step recovery diode) to drive a pulse into the laser diode. In an opening switch-based circuit, the energy is stored in an inductor and is released by the inductor into the laser diode by the switch. As shown in Figure 2, the current risetime is dependent on the speed of the opening switch and the pulse width is dependent on the L/R time constant of the circuit. To reiterate, these types of circuits in which the switch releases energy from an inductor are fundamentally different from the claimed circuit in which the switch releases energy from capacitors.

As an aside, an opening switch based circuit may use a capacitive energy storage element to energize the inductor, whose energy is then transferred to the laser diode. However, it is important not to confuse such a capacitor with the claimed energy storage elements. As claimed, the laser diode is "controllably coupled through the switch-controlled circuit path to the first energy storage element for receiving a discharge of energy therefrom, and to the second energy storage element for receiving a discharge of energy therefrom" (emphasis supplied).

Following is a detailed explanation of why the capacitors disclosed in Takahashi do not discharge energy into the laser diode.

The examiner compares the first energy storage element to capacitor 10 (Figure 1 of Takahashi). However, it is easy to see that the energy stored in this element is not transferred to the laser diode. By looking at Figure 1 one can see that the forward current (labeled I_f) flows mainly through the resistor 9, and the voltage developed across the capacitor 10 is just the voltage drop across the resistor, which can in fact be arbitrarily small since the resistor 9 is variable. Moreover, when the current reverses through the diode element 8, the reverse current (which mainly flows through capacitor #10, which is not shown in Figure 1) flows only through the inductor 7 (current labeled I_r in Figure 1), not the laser diode 4. Thus any energy associated with capacitor 10 is transferred to the inductor 7, and not to the laser diode 4. Also since the energy is transferred to the laser diode 4 during the opening of the diode 8 (refer to the timing in Figure 2) the capacitor 10 is decoupled from the circuit (it is in series with and open

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circuit) and thus cannot possibly transfer energy to the laser diode. The energy is transferred from the inductor 7 to the laser diode 4.

Regarding capacitor 10, it is only mentioned once in Takahashi, as its function is not germane to the operation of the circuit. Capacitor 10 acts simply as a bypass capacitor across resistor 9. If this capacitor was removed the circuit would still operate in a very similar fashion. Therefore, capacitor 10 cannot be compared to the claimed first energy storage element.

The examiner also compares the second energy storage element to capacitor 13 in Figure 1. This again is not correct. Capacitor 13 is simply a DC blocking capacitor. Takahashi states in column 5, lines 17-21 that "... a DC component is removed from the output voltage V_j with the aid of the variable capacitor 13 and the resultant voltage is applied to the light source, namely, the semiconductor laser 4 and to the delay line 12." This DC blocking capacitor is used to remove the DC component as this component would be shorted by the addition of the delay line 12.

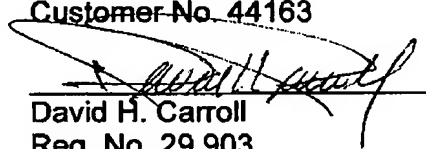
Conclusion

In view of the foregoing amendments, it is believed that the application is now in condition for allowance. Applicants respectfully request favorable reconsideration and the timely issuance of a Notice of Allowance.

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